Bear Lake Integrated Visual Design Plan

Ministry of Forests

Forest Practices Branch

Penticton Forest District

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1.0 INTRODUCTION

Campbell Jarvis, Forestry and Landscape Architecture, were engaged by the Ministry of Forests Forest Practices Branch to prepare an Integrated Visual Design Plan for the Bear Lake viewshed, a significant recreation area situated within the Penticton Forest District.

The intent of the Integrated Design Plan is to provide direction for the long-term development of the timber resource adjacent to Bear Lake in a manner consistent with higher-level planning direction and respectful of other resource values. Employing a process that considers all resource values simultaneously in an integrated fashion it is a strategic plan focused on optimising harvest opportunities in visually sensitive areas without compromising desired visual quality.

The Bear Lake Integrated Visual Design Plan approximates how long-term forest development could occur over time within the Bear Lake project area. It has been prepared on the basis of digital data, aerial photography, map projections and limited ground reconnaissance. As such, the plan should be considered draft only. To ensure the feasibility of the plan further, more detailed consideration and additional ground assessments are warranted.

Purpose of the Report

This report offers a brief summary of the design objectives, design assumptions, design criteria and opportunities and constraints analysis employed in the development of the plan. Additional discussion summarises the process employed, specifying the key tasks associated with each phase and how information was combined and used in the design process.

2.0 DESIGN OBJECTIVES

Design objectives identify the targets the design plan aims to achieve. The design objectives for the Bear Lake design plan were derived in part through:

i) Direct consultation with the Penticton Forest District and other agencies;
ii) Reference to the specific resource management goals and objectives presented in the Draft Okanagan / Shuswap LRMP and;
iii) Reference to the relevant legislation and policy governing activities in the planning area.

Key resource objectives are summarised in the following.

Visual Resources

- Achieve a Visual Quality Objective of Retention (R) in visually sensitive areas.
- Achieve a Visual Quality Objective of Modification (M) in non-visually sensitive areas.
- Maintain the integrity of the Lakeshore Management Zone as per the Penticton District LMZ guidelines.
- Rehabilitate the shape of existing harvest areas to ensure subsequent development is of an appropriate design.

Timber Resources

- Maximize harvest opportunities in the visually sensitive areas of the planning area in the 1st and 2nd passes.

Recreation / Tourism Resources

- Maintain the integrity of the existing recreation experience (solitude, quiet, visual landscape).
- Maintain the visual integrity and recreational experience of the landscapes surrounding the private fishing lodge.

Water Resources

- Protect the quality of water resources (wetlands, lake, stream) for downstream uses.
- Minimise opportunities for access to the Lambly and Powers Community Watershed areas.

Fish / Wildlife Resources

- Retain sufficient habitat to address Moose Winter Range habitat requirements.
- Protect water quality and existing habitat necessary to sustain the fish resource.
- Protect the water quality of non-fish bearing streams.

Cultural / Archaeological Resources

- Minimize disturbance in areas identified as having moderate to high archaeological potential (areas adjacent to the eastern, northern and southern shores of Bear Lake)

3.0 DESIGN ASSUMPTIONS

The design phase of the project was governed by several resource use and management assumptions. These are as follows.

Operability

Using ArcView GIS, the TRIM, FC1 and Terrain Assessment coverages were queried to identify the harvestable land base for the planning area. The output of this analysis is a coverage identifying inoperable areas based on specific biophysical and geotechnical criteria and stand characteristics. Areas outside of lands described by these criteria were considered operable for design purposes.

The following assumptions were employed to create the operability coverage. Any lands inclusive of the following characteristics were deemed inoperable for planning purposes.

Terrain Hazard

- Terrain Hazard Class V
- Terrain Hazard Class IV (Moderate to High risk of Erosion)

Environmentally Sensitive Areas

- ES_1 or ES_2 (Soils, Erosion or Regeneration issues)

Non-Productive Forest Types

- Non-Productive Forest Types (Brush, Rock, Deciduous)
- Pl 420 stands

Low to Poor Sites in Combination with ESA_1 (P or S)

- Fir (Fd) and Spruce (S) stands with a Site Index of 14 or less
- Pine (Pl) stands with a Site Index of 10 or less
- Balsam (B) stands with a Site Index of 10 or less

Riparian Management Areas

- Riparian Reserve Zones
- Lakeshore Reserve Zones

Harvesting

On the basis of discussions with Penticton Forest District staff, the following assumptions respecting harvest and silvicultural systems were employed in the design plan.

Harvest System

- Helicopter and / or Cable systems to be employed for stands situated within the steeper portions of visually sensitive areas.
- Ground based systems to be employed in the lowland areas adjacent to the northern shores of the lake.
- Ground based systems to be employed in the upper bench lands area situated in the far eastern portions of the planning area.
- Ground based systems for Slopes < 35%
- Cable or Helicopter systems for Slopes exceeding 35%

Silvicultural System

- Partial cutting systems in all stands with leading or 2nd species (in VSA's) Fir (Fd)
- Clear-cut with reserve / Variable retention systems for the predominately PL (Pine) stands; removing the Pl stems and retaining the Fd, S and deciduous stems.

Visual Resource

Viewshed

- Defined by the 4 viewpoints identified during the site visit.
- Designer viewpoint = Viewpoint B (New Recreation site on Western Shore of the Lake)
- Extent of the screening effect of vegetation = 18 metres

Maximum Stems Removed to Achieve Retention VQO in Partial Cutting Stands

- 40 - 50% of the stems / volume (as per the Partial Cutting to Meet VQO's Study

4.0 DESIGN CRITERIA

To ensure the planning and resource objectives are adequately addressed in the design plan, physical design criteria specific to each resource are identified. The design criteria form the basis of the design programme, influencing the scope and nature of the design exploration occurring in subsequent phases of the project. The design criteria respond directly to the planning area objectives and design issues and strategies, providing a means for addressing each.

The criteria employed in the design phase is summarised in the following.

Visual Landscape

- Visual Quality Objective (VQO) of Retention (R) in all visible areas.
- Visual Quality Objective of Modification (M) in non-visible areas.
- For harvest units employing Clear-cut, Patch cut or Clear-cut with Reserves in visible areas, percent alteration is to be between 0-2%
- For harvest units employing Partial cutting systems in visible areas, maximum level of removal to approximate 50% of the stems in the stand.
- Design of cut blocks to emulate naturally occurring elements in the landscape (line, form, colour, texture, scale, vegetative patterns, naturally occurring openings, etc).
- Design of cut blocks to respond to the dominant lines of force that characterise the landform structure of the project area.
- Ensure diversity in the size of harvest openings, employing size and scale of the natural openings, vegetation patterns and landform features as a cue.
- Retain leave trees, leave patches, deciduous vegetation, and understory trees within the block employing systems other than partial cutting in order to reduce visual impacts.
- Vary the size and shape of leave patches to ensure a more natural appearance results.

Harvest Design

- Employ singletree selection systems in stands where Fd is the leading or secondary species.
- Employ patch cut or small clear-cut with reserve systems in stands that are predominately Pine.
- Employ helicopter and / or long-line cable systems to minimize road development.
- Utilise existing road network for drop-zones and landings.
- Situate landings away from recreation areas to minimise impacts on the recreation experience.

Moose Winter Range

- Maintain a minimum of 15% of the net-forested land base in young forests.
- Maintain an early seral component within MWR (defined as less than 25 years for IDF and less than 35 years for MS BGCZ).
- Retain deciduous stems (mature aspen, birch and cottonwood) within cut blocks.
- Clumps or patches are preferred (in order to approximate the pre-harvest deciduous component of the stand).
- To retain the pre-harvest deciduous component.
- Maintain a minimum of 33% of the stands in moose winter range (MWR) at least 16 m in height.
- Maintain 40% of the vegetated area of each MMU at greater than or equal to 16 meters in height.

Ecosystem /Natural Disturbance Types

NDT3 (Lower Reaches of the north-eastern component of the project area)

- Employ a clustered harvest pattern, using large aggregated harvest units (to simulate the natural pattern of large fires and large unburned areas).
- Retain patches of forest or single trees within the aggregated harvest units (to simulate the island remnants left within areas of large burns).
- Maintain forest cover adjacent to stream riparian areas to sustain cross-elevational and lowland / upland connectivity.
- Partial cutting systems should be used in Douglas fir and larch stands.
- Employ partial cutting systems to maintain mature forest attributes in spruce and fir stands.
- Retain some mature Douglas fir in stands where they constitute a minor component of the stand.

NDT4 (Remainder of the project area)

- Employ Partial cutting, combined with occasional smaller dispersed clear-cut, to approximate the pattern of the natural landscape.
- Retain structural attributes (i.e., live and dead trees) consistent with the natural disturbance type within the harvest units.
- Retain mature forest riparian areas around individual wetlands, wetland complexes, and streams to sustain stream riparian, upland / lowland and cross-elevational connectivity.

Lakeshore Management

Landscape

- Visual Quality Objective of Retention in visually sensitive areas within LMZ.

Silvicultural Systems

- No Clear cutting within the LMZ unless partial cutting is not feasible due to site a stand characteristics.
- If partial cutting, a minimum of 50 per cent of the original basal area of the stand should be retained.
- If partial cutting systems are unacceptable, then a maximum five (5) hectare clear-cut block is permitted. Reasons selection harvesting cannot be
- accomplished must be stated in the proponents forest development plan and silviculture prescription.
- Ninety per cent of the LMZ should be retained in a non-equivalent clear-cut state (i.e., maximum 10 per cent equivalent clear-cut area).

Spatial Development of LMZ

- A maximum of 25 per cent of the LMZ may be cut during each pass. A higher percentage may be acceptable if significantly more than 50 per cent of the
- undisturbed crown closure is retained.

Access / Road Development

- Locate haul roads outside the Lakeshore Management Zone (LMZ).
- Spur roads and landings are to be located a minimum of 200 m from the Riparian Reserve Zone (RRZ).
- No development of Back spar trails unless a rehabilitation plan has been approved.
- No Skid roads with cuts greater than 25 cm cuts within the LMZ in areas where visual and/ or physical resources are an issue.

Riparian Management Areas

Streams

- Maintain adequate riparian management zones along identified fish bearing streams as per the Forest Practices Code (see below).

Riparian Class	Riparian Reserve Zone (metres)	Riparian Management Zone	Riparian Management Area (metres)
S-2	30	20	50
S-3	20	20	40
S-4	0	30	30
S-5	0	30	30
S-6	0	20	20

Wetlands

- Maintain adequate riparian management areas adjacent to wetland areas as per the Forest Practices Code (see below)

Riparian Class	Riparian Reserve Zone (metres)	Riparian Management Zone	Riparian Management Area (metres)
W-1	10	40	50
W-2	10	20	30
W-3	0	30	30

Lakes

- Maintain an adequate Riparian Management Area adjacent to Lake areas as per the Forest Practices Code and the Pentiction Forest District Lakeshore Management Guidelines (see below)

Riparian Class	Riparian Reserve Zone (metres)	Riparian Management Zone	Riparian Management Area (metres)
L-1	10	200	210
L-2	10	20	30

Recreation

The lake is a significant recreation resource for activities both on and off the water. A campsite and day use area is situated at the northern end of the lake, the existing campsite located within the Lakeshore Management Zone. Several other

camping sites will be developed in the coming year adjacent to the north-western shore. These sites will have an almost unimpeded view of the subject landscape. Design criteria for addressing recreation resource needs are:

- Retain an adequate transition between the existing recreation site and harvest operations. The transition must be substantive enough to minimize disturbance from noise and dust associated with forest development activities.
- Maintain the visual integrity of the visible landscape (VQO of Retention) as viewed from the existing day use area (adjacent to the dam feature|), the lake surface and the proposed camping sites along the western shore of Bear Lake.

Moose Winter Range

Moose Winter Range covers the majority of the project area. The primary management goal for moose winter habitat is to provide adequate forage and cover over the long term and to limit the adverse impacts of access. Design criteria specific to this objective include:

- Provide adequate forest cover to allow for access to forage, movement, thermal cover and snow interception and protection from harassment.
- Maintain a minimum of 33% of the stand at approximately 16 m in height.
- Locate thermal cover areas in areas with crown closure approximating 6, 7 and 8.
- Maintain approximately 50% of the cover requirements in units of 20 ha or greater to provide security cover.

5.0 The Process

The process may be thought of in terms of three major phases. The first, *inventory*, is concerned with gathering information about a sites myriad abiotic, biotic, cultural, ecological and regulatory influences. The second, *analysis*, is focused on identifying the dominant patterns, structures and functions of a landscape through a process that combines and interprets resource information such that its significance is understood in terms:

What the site can actually produce in terms of timber and other resources, and;

a) The limitations and opportunities for use and management.

The third phase, *design*, employs the understanding gained about structure, function and limitations or opportunities to development to guide the physical design of the site. It is a process of taking landscape apart; examining and interpreting it and then putting it back together in a manner providing direction as to where and how development might occur.

Figure 1: Integrated Visual Design Process Flow Chart

The BC Ministry of Forests Total Resource / Integrated Visual Design Process (Visual Landscape Design Training Manual; BC Ministry of Forests 1994)

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Figure 1: Integrated Visual Design Process Flow Chart

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Understanding how the process addresses resource integration and harvest optimisation in the context of visual constraints is best achieved by examining a case study of the process in action. The following provides a brief account of the Bear Lake Integrated Visual Design Plan planning process as implemented.

During August 2000 the IVD process was employed to a site situated in the Bear Lake drainage, 20 km. west of the community of Kelowna in the Okanagan valley (**Figure 2**). The plan's primary objective was to define how long-term development of the timber resource could occur in a manner consistent with Okanagan / Shuswap HLP direction. Each phase of the design process as implemented is described in detail in the following.

5.1 Planning Area Context

The planning area boundary was defined on a basis of topographic and cultural features and encompasses 1600 hectares, approximately 840 hectares of which are operable. The area is characterised by significant fish and wildlife, tourism, landscape and recreation resources, is situated within two community watersheds and encompasses large areas of geodetically unstable terrain and sites of low productivity. A large proportion of the area is visually sensitive and must be managed to a VQO of R (Retention). The forest cover (*Pinus contorta* and *Psuedotsuga mensezii*) reflects the influence of the frequent stand initiating fire events occurring approximately every 120 years. These events produced a forest cover characterised by extensive stands of uniform age. This was problematic in terms of harvest scheduling because of adjacency and harvest unit size constraints.

A portion of the area is a component of the Penticton Forest District's Small Business Forest Enterprise Programme (SBFEP) and is considered an integral component of the working forest. Explicit in the direction was an imperative to identify how timber development could be sustained over time

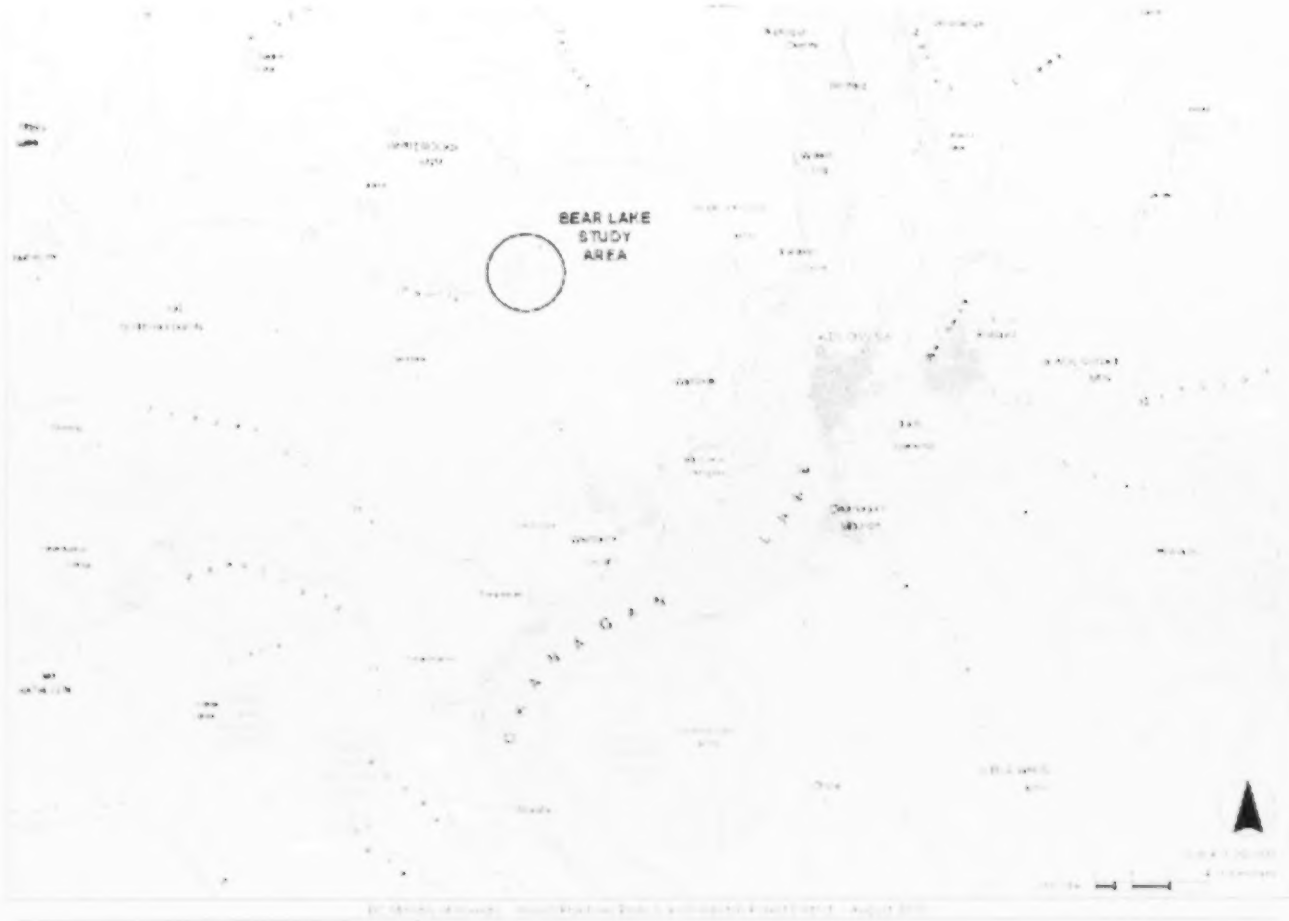

Figure 2: Bear Lake Study Area Location Map

in the area and to define a viable first pass for the area for harvest within the next five-year cycle.

5.2 Setting Objectives / Project Initiation

The design was a product of staff from the Penticton Forest District and Kamloops Forest Region and a design consultant who served as the primary forest design specialist. The HLP provided initial direction, specifying riparian, visual, recreation, wildlife and water resource objectives. Specific, site level resource targets were identified by the planning team, including desired levels of harvest volumes, preferred harvest and silvicultural systems as identified in Section 2 of this report.

A field inspection of the site was conducted, primarily to identify the viewpoints that would be employed to assess and model the landscape. Four viewpoints were selected from which landscape photography was conducted. Viewpoint B (**Figure 3**), situated on the western shores of the lake was selected as the 'Designer" viewpoint from which the primary landscape analysis and design occurred. This was selected because it offered a frontal, mid-ground view of the landscape, representing the 'worst-case' design scenario (**Figure 4**). It is also the site of a recreation site, offering users a stationary, long-term viewing opportunity of the subject landscape.

5.3 The Landscape Inventory -- Disassembling the Landscape

A comprehensive resource inventory of biotic, abiotic, cultural, ecological information and regulatory requirements was compiled to gain an understanding for the full range of factors influencing the area. This information, collected in both digital and hardcopy format, was collated and prepared for use in subsequent phases of the process. Considerable effort was required to convert hardcopy information into a digital format suitable for GIS analysis.

Figure 3: Map of Bear Lake showing Viewpoints and extent of Visible Area

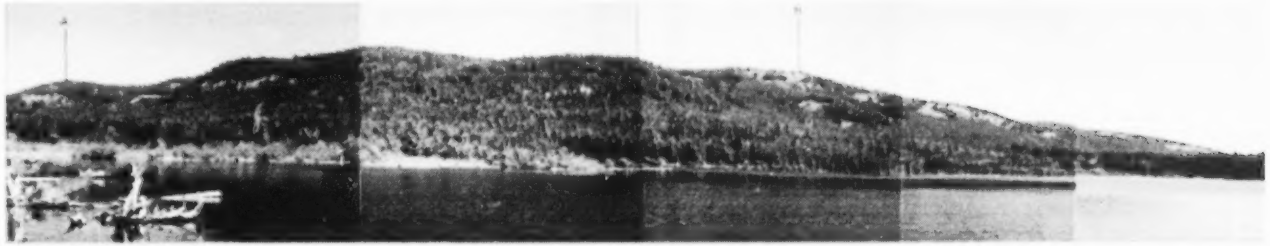

Figure 4: Photograph showing viewscape as seen from Viewpoint B

5.4 The Landscape Analysis – Re-Assembling and Interpreting the Landscape

This step was concerned with understanding the resource inventory information in a manner that revealed its influence on use and development. Employing ArcView GIS, the resource information was combined and analysed, the primary aim being to identify the key landscape patterns, processes and functions influencing design development. The outputs of this phase were:

a) An operability assessment
b) Landform and Landscape Character Assessments
c) Delineation of Design Planning Units and;
d) An opportunities and constraints analysis

Each product is described in detail in the following.

5.4.1 Operability Assessment

The *Operability Assessment* defined the first order physical design structure. Employing a GIS resource overlay of terrain hazards (**Figure 5**), inoperable stands (**Figure 6**), riparian and wetland management areas (**Figure 7**) and other relevant information, the assessment identified those areas that were fixed (e.g. were precluded from development for physical, environmental or regulatory reasons) or variable (e.g. the forest resource could be developed to some degree depending upon the site and regulatory influences). The 'fixed / variable' plan represented the sum of all regulatory, functional, ecological and biophysical influences factors influencing the site defining broad patterns in operability. This was expressed in the Composite Constraints Plan (**Figure 8**). Employing World Construction Set software, a 3D perspective view of the composite constraints **(Figure 9)** was generated as viewed from Viewpoint "B". This provided an understanding for the broad patterns created in the landscape that served to guide the visual design of harvest units.

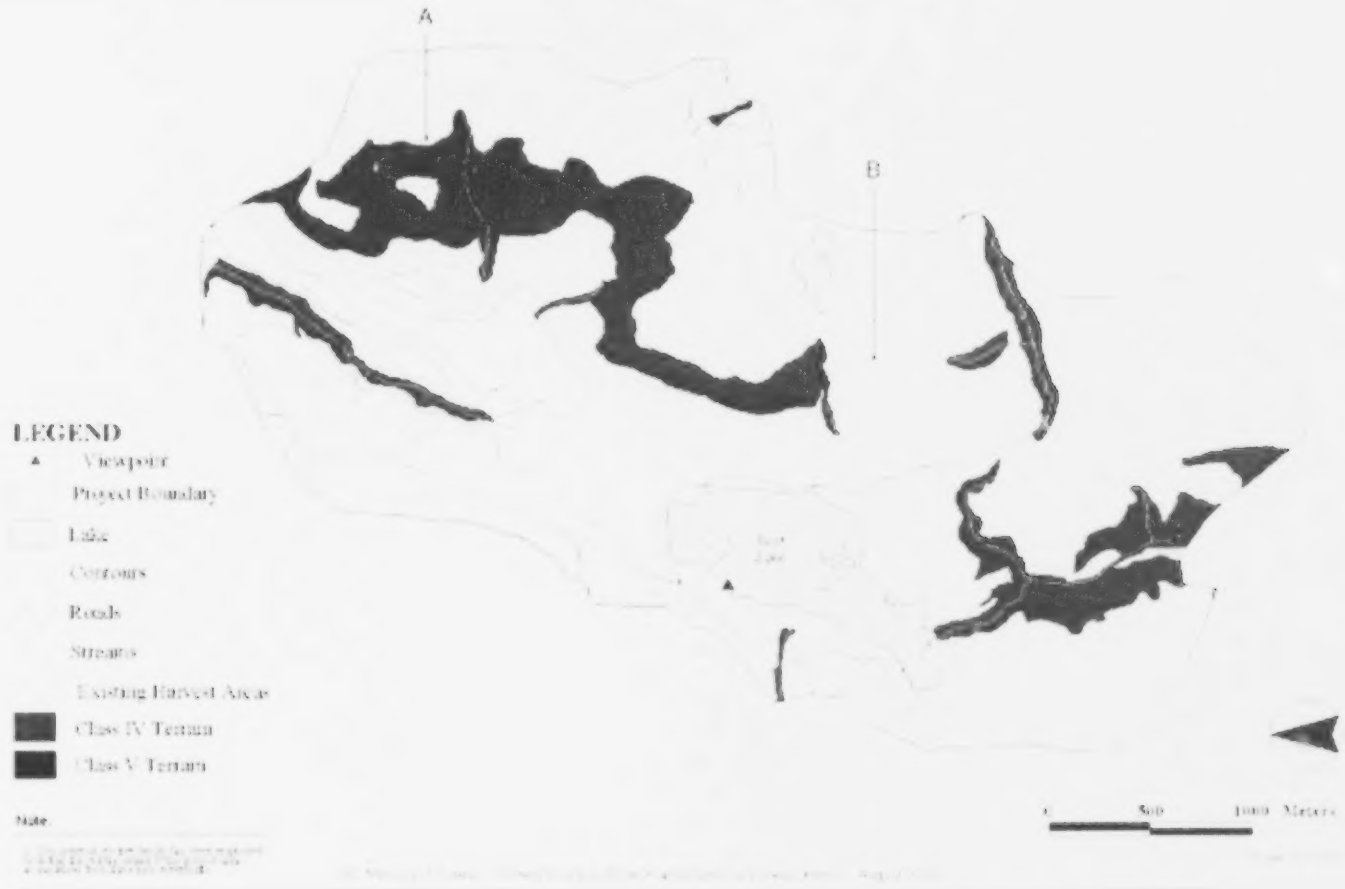

Figure 5: Terrain Hazard mapping

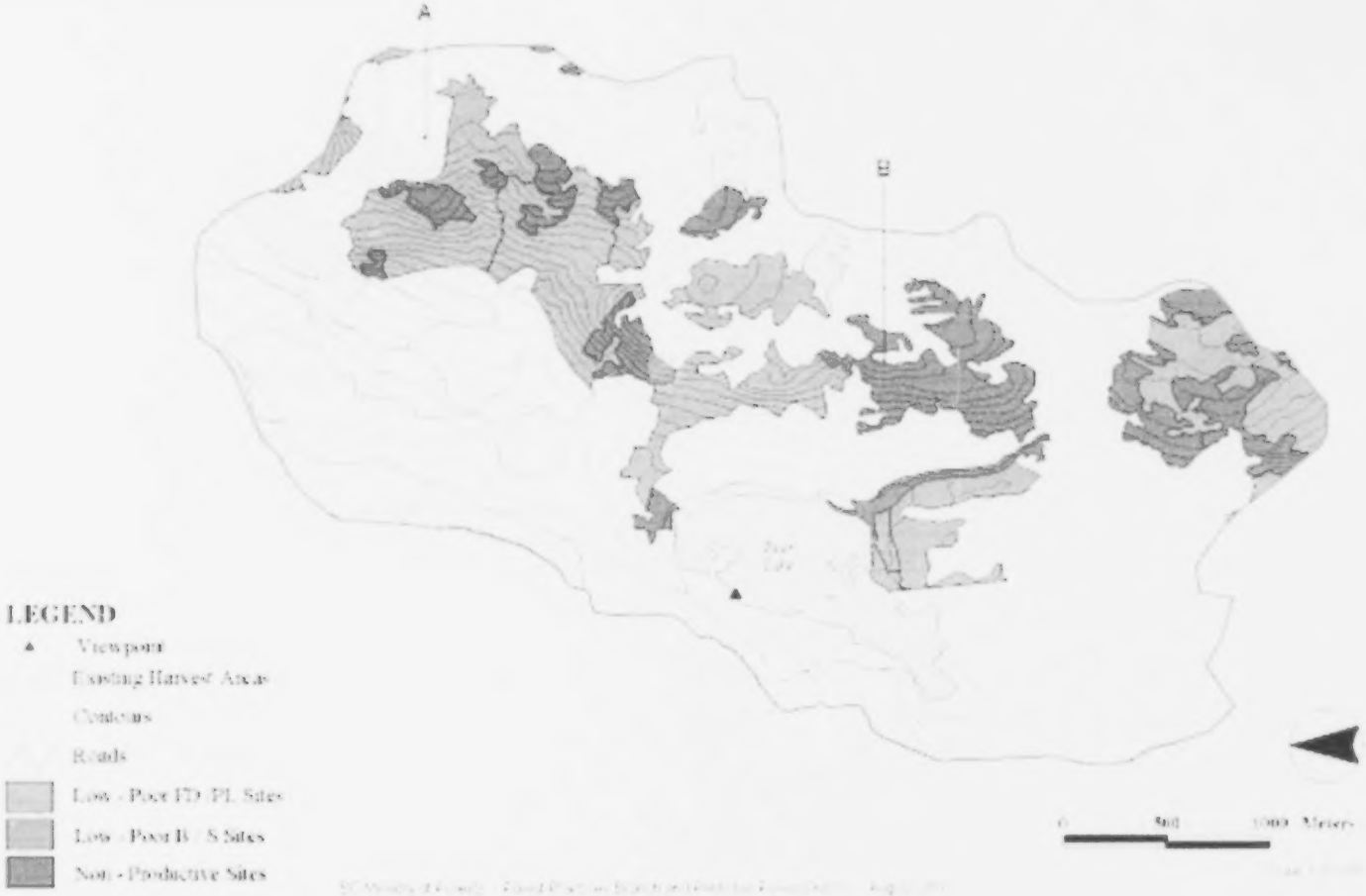

Figure 6: Inoperable Stands

Figure 7: Riparian and Wetlands

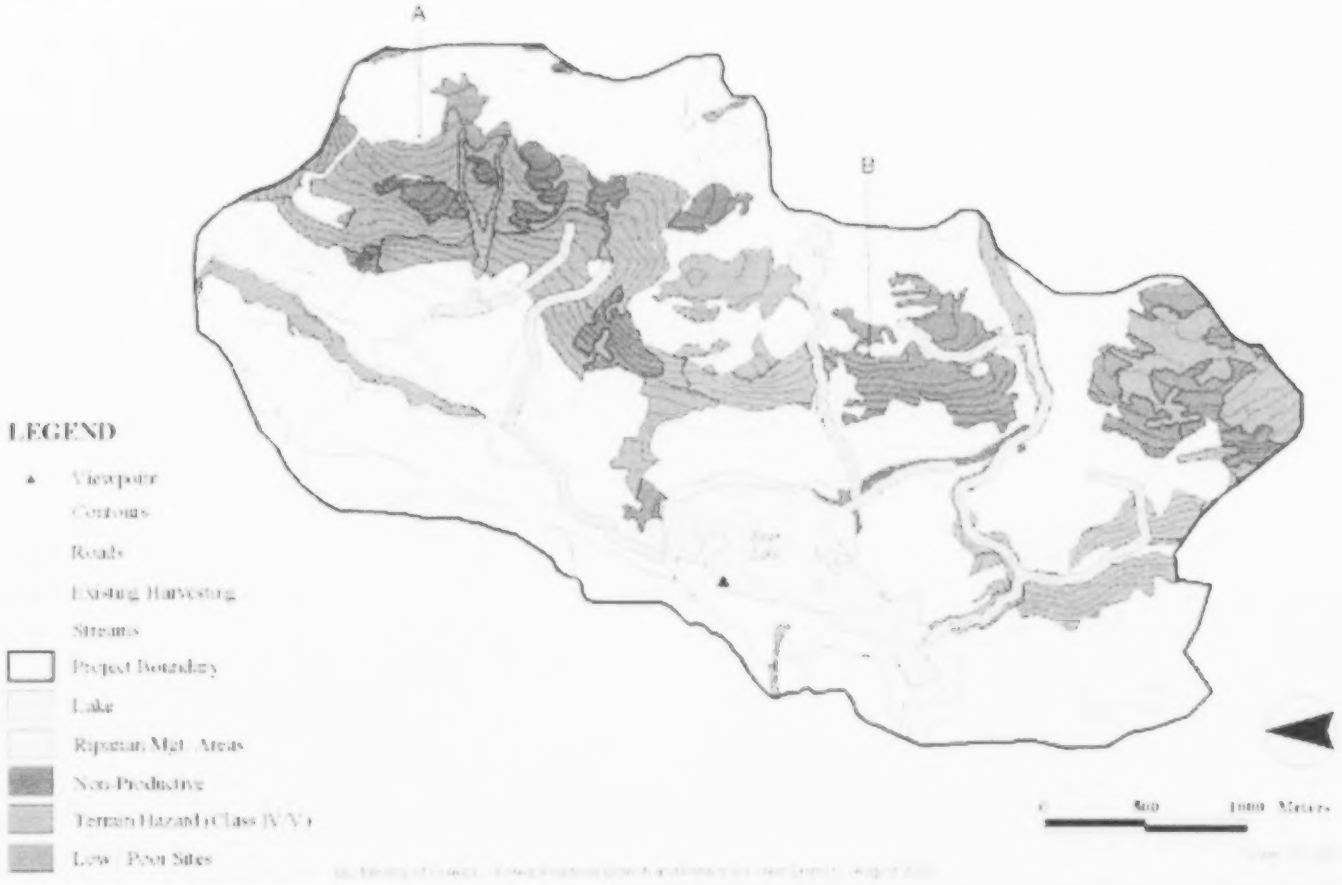

Figure 8: Composite Constraints - Plain View

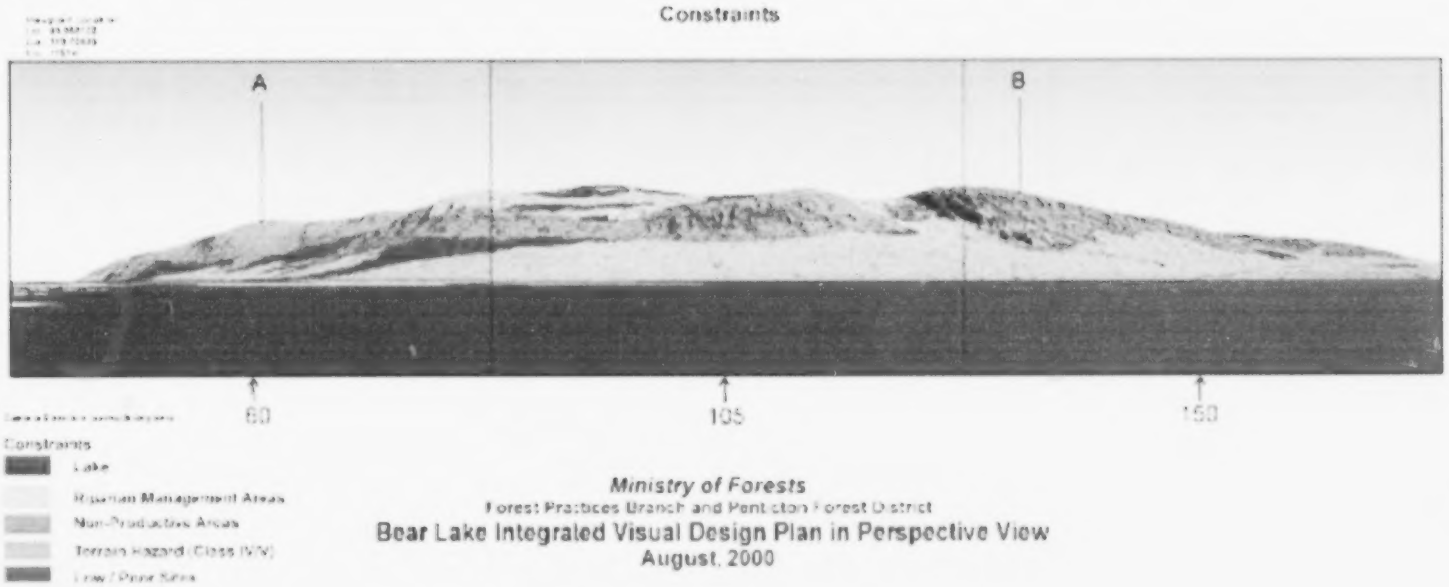

Figure 9: Composite Constraints - draped on 3D model

5.4.2 Landscape Character Analyses

The *Landscape Character Analysis* consisted of two components:

a) a Landform Analysis (**Figures 10 and 11**) and;
b) a Landscape Character Analysis (**Figures 12 and 13**).

Employing the lines of force concept and subjective descriptive methods these analyses provided an understanding for the major patterns in the visible landscape in terms of vegetation and landform. The Landscape Character Analysis information, presented in both plan and perspective views as seen from the Viewpoint B (a proposed recreation site) was employed to ensure proposed interventions were well integrated with their landscape context.

5.4.3 Delineating Design Planning Units

This step was concerned with defining a physical framework that reduced the complexity of the task by organising site and resource information in a meaningful manner to guide physical design activities. Employing professional judgement, the landscape was divided into four units, each of a relatively homogenous character in terms of site conditions and influences (**Figure 14**) These units were then summarised in terms how the site resources within each interacted to influence the opportunities and constraints for development.

Figure 10: Lines of Force - Perspective View

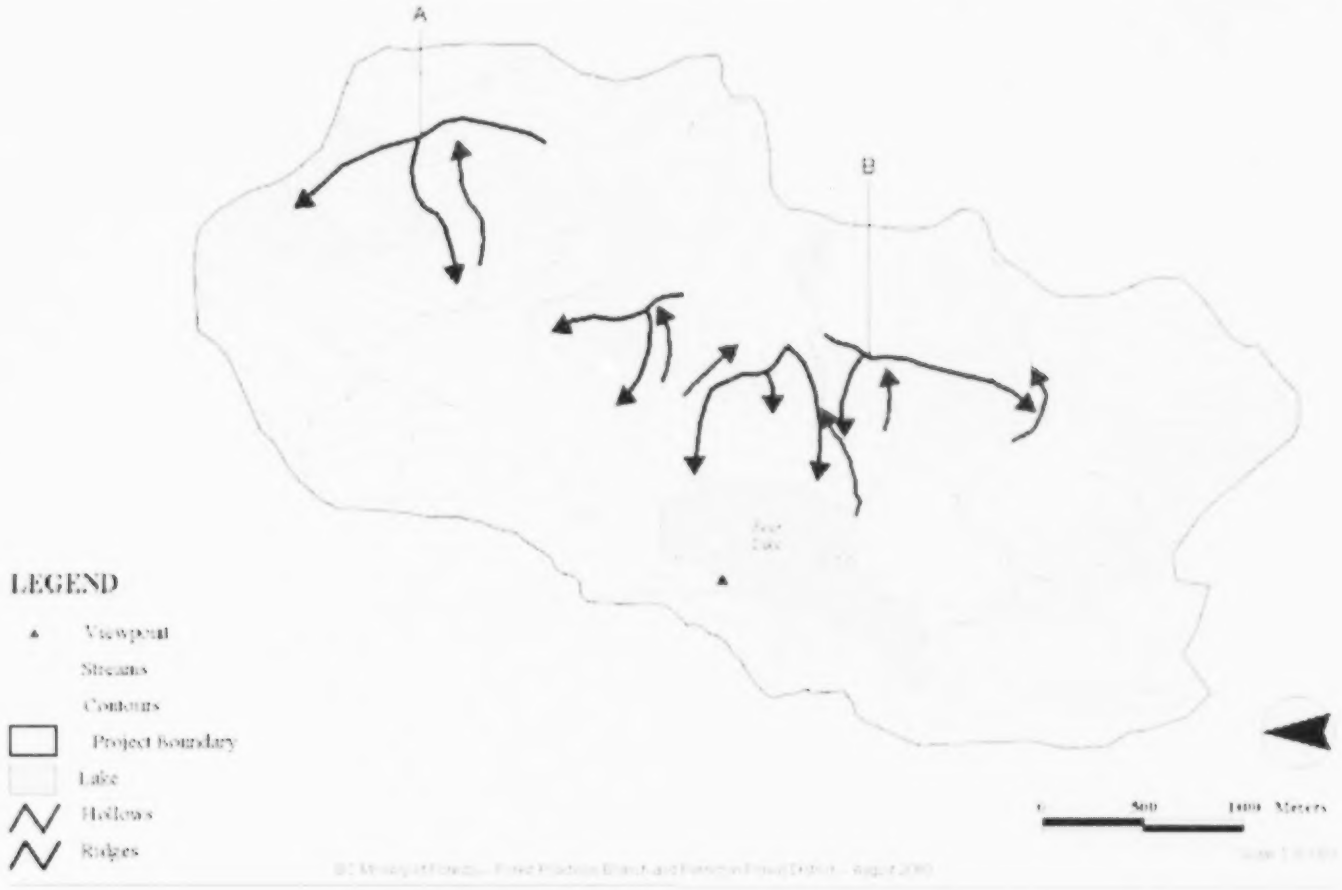

Figure 11: Lines of Force - Plan View

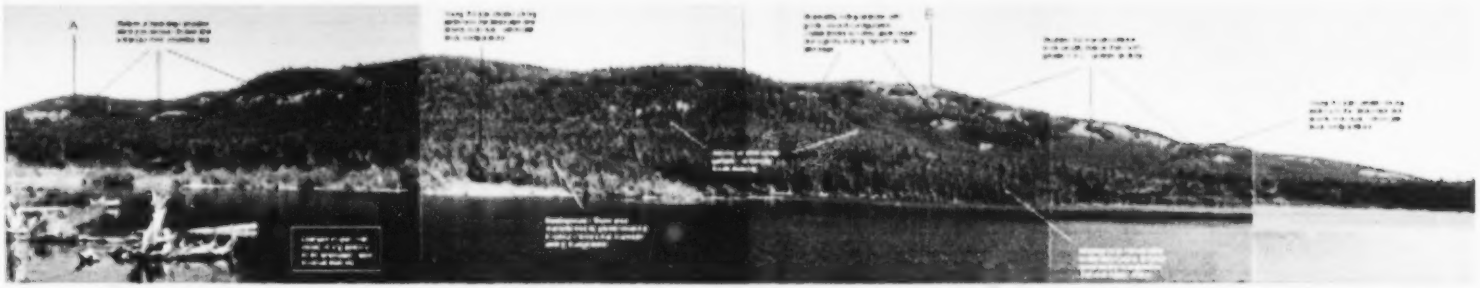

Figure 12: Land Character Analysis - Perspective View

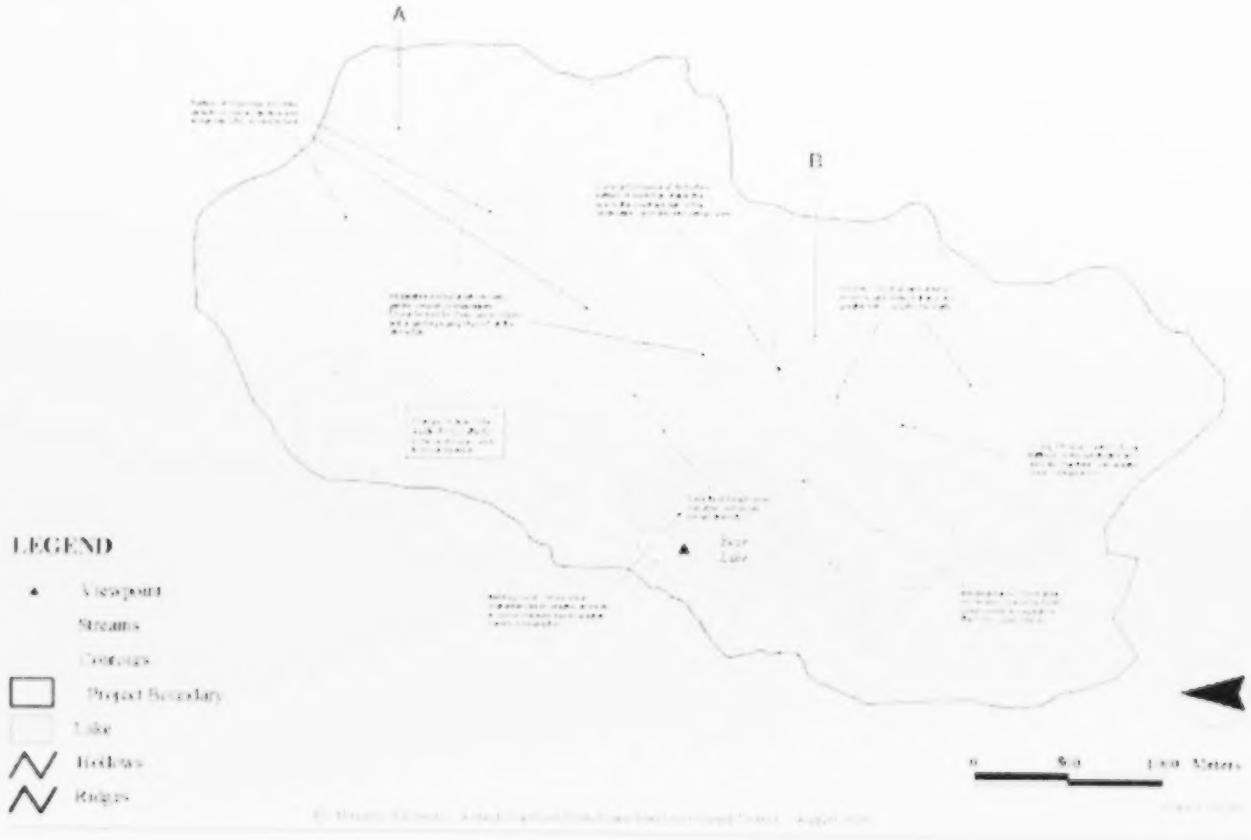

Figure 13: Land Character Analysis - Plan View

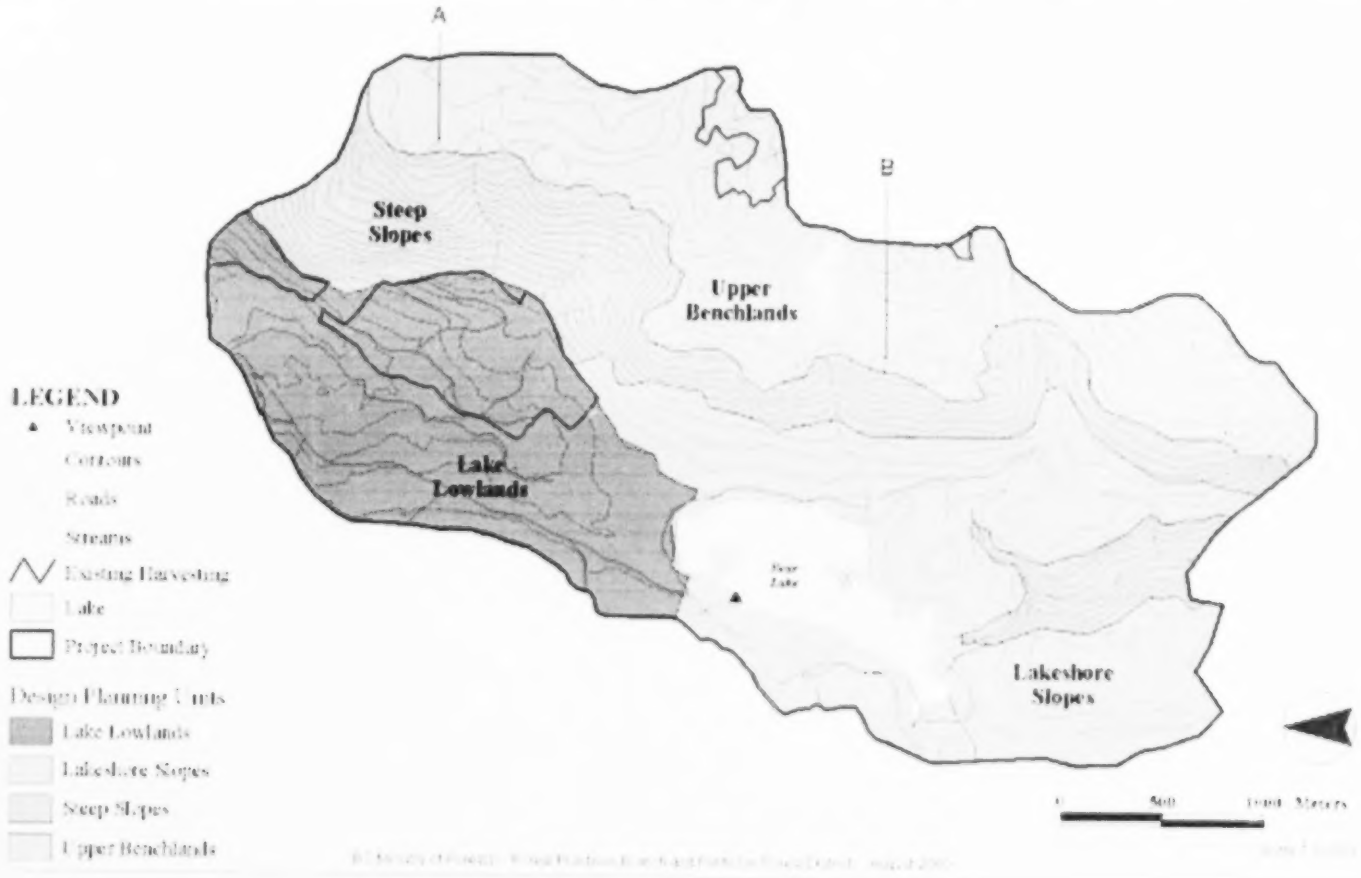

Figure 14: Design Planning Units

Figure 14: Design Planning Units

5.5 Opportunities and Constraints Analysis

Each Design Planning Unit was summarised in tabular form, identifying how each resource (landscape, forest cover, terrain, access, silviculture, wildlife etc) influenced use and development). The interactions were then expressed in terms of opportunities and constraints to development. Once completed, this assessment permitted key resource design issues to be identified. In response, design objectives (e.g. stand structure, degree of landscape alteration) specific to each issue could be identified and design strategies and principles for achieving the objectives devised (e.g. silvicultural or harvest systems, timing of harvest etc). These notions were assessed in terms of their compatibility with HLP direction and accepted, modified or rejected as required. Collectively, the results of the analysis began to suggest a design programme

5.6 Developing the Forest Concept Design

During the analysis phase, loose ideas about how the site might develop began to take form that combined, suggested an integrated concept. The design concept acted as a bridge between the analysis and the detailed design phases and is the where analysis became synthesis. Combined with the findings of the resource analysis, landscape character analysis and landscape photography, these ideas served as a source of identifying a range of possible physical design responses, identifying how and where they might occur.

This 'book-k[illegible]pproach towards information manage[illegible]

a. [illegible]lexity associated with the co[illegible]me of resource information collected by com[illegible]and organising it in a meaningful manner;
b. to reveal the significance of the inventory information in terms of forest design and development and;
c. to redefine and clarify the larger design problem by breaking it down into a series of smaller, manageable problems that, once solved, contributed to the resolution of the whole.

inspiration from which the concept evolved. The ideas were expressed quickly as sketches and bubble diagram's with annotation illustrating how timber and other resources could be managed and developed. Information respecting silvicultural and harvest systems, levels of retention within the stand, timing of harvest, access, landings etc. were included as annotations. From these, a viable alternative that provisionally satisfied the HLP and design objectives was selected for further development and refinement.

5.7 Detailed Design Phase

Whereas the analysis phase was a methodical and objective activity, this component entailed the interpretation of the landscape resource analysis information in creative, subjective manner. The primary objective of this phase was to design a complete pattern of harvest units that were integrated with their landscape setting (visual and ecological) and which satisfied the HLP direction and legislation. Of equal importance was the design of the 'fixed' elements in the landscape.

With the design concept as a starting point and the opportunities and constraints analysis as a point of reference, operable areas were sub-divided into individual harvest units. The shape, extent and location of individual harvest units began to evolve from the landscape, each responding to the underlying landform, patterns in vegetation and age class and functional considerations such as road locations, landing areas and optimum yarning or skidding distances.

Stand and ecological dynamics strongly influenced the nature of the design. The fire history characterising the area produced distinctive patterns in species composition and age class and were related to the underlying landform structure. In concert with functional and regulatory considerations, these patterns governed the development of the physical form and scheduling of proposed harvest units. As these patterns served as the basis for unit design the shape, position and size of the harvest units emulated the patterns of natural disturbance and topography. This produced interventions that achieved integration with their physical, ecological and visual context.

The mixed Pine and Fir species characteristic of these dynamics provided opportunities to employ partial cutting systems (selectively removing the Fir and patch cutting the Pine species) in visible areas, reducing the visual impacts of development. While production rates were low (because of the visual constraint), the approach optimal utilisation of the timber resource. The extensive Pine stands situated in the non-visible areas offered opportunities for larger-scale clear-cut development and higher rates of production. Ensuring each development pass included units from both visible and non-visible segments of the planning area permitted economically viable development.

After several iterations, a complete pattern of harvest units (**Figure 15**) emerged depicting all possible harvest opportunities over the period of one rotation (approximately 100 years), specifying the harvest and silvicultural system for each. On the basis of adjacency, visual and age class considerations, the phasing of each harvest pass was determined. Employing GIS and 3-D simulation software the scheme was draped on a 3-D model and simulated as viewed from Viewpoint B (**Figure 16**). This permitted an assessment of how well each block responded to the underlying landscape structure.

Each proposed harvest pass was then assessed in terms of how well design criteria was addressed in terms of functional, visual, environmental and economic criteria (**Figure 17, Harvesting 2001; Figure 18, Harvesting 2015; Figure 19 Harvesting 2030 - 2070**,).

A first pass development scheme was selected that best addressed the HLP direction and site influences. This was modelled to identify visual impacts as viewed from Viewpoint B and in terms of the anticipated timber outputs expected from the plan (**Appendix I**).

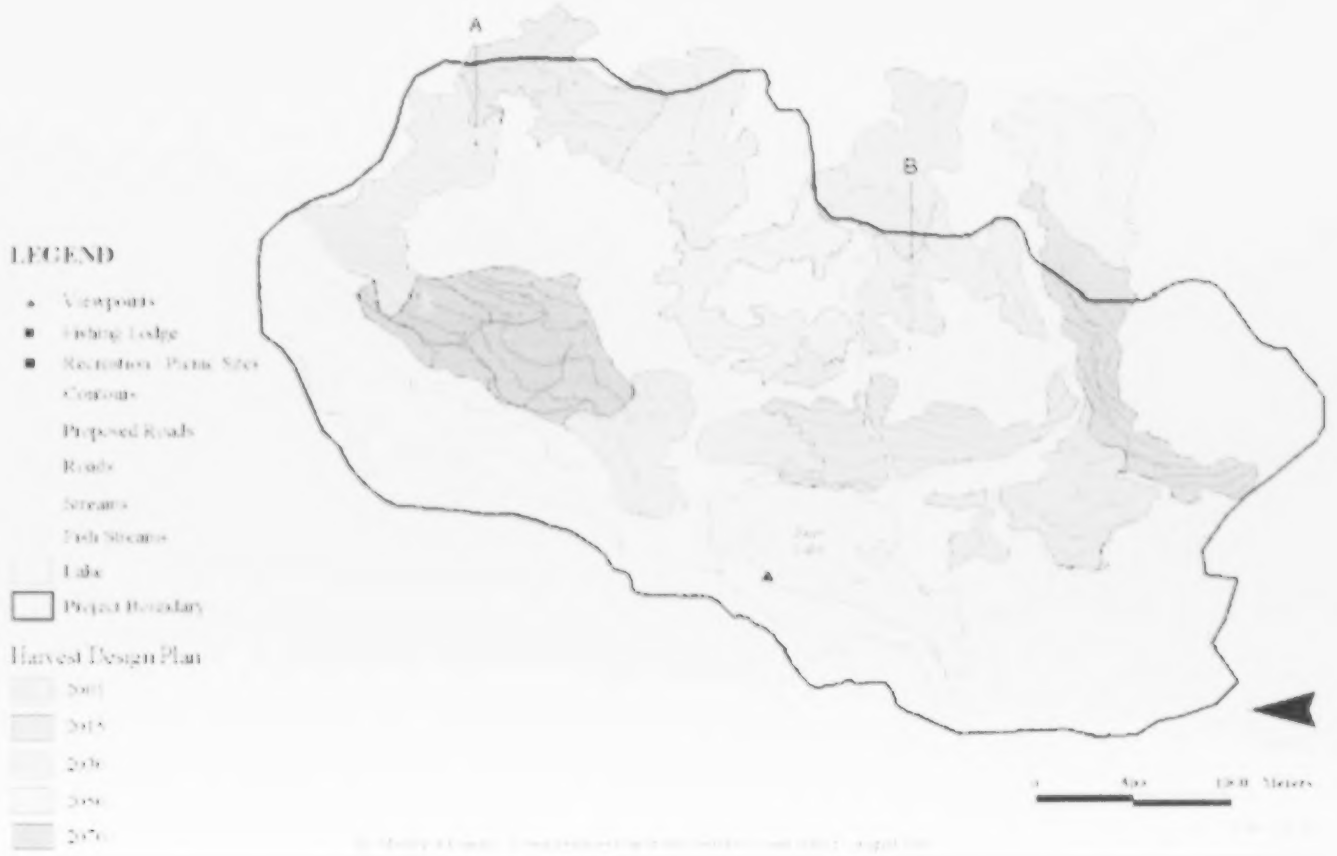

Figure 15: Complete Pattern of Harvest units

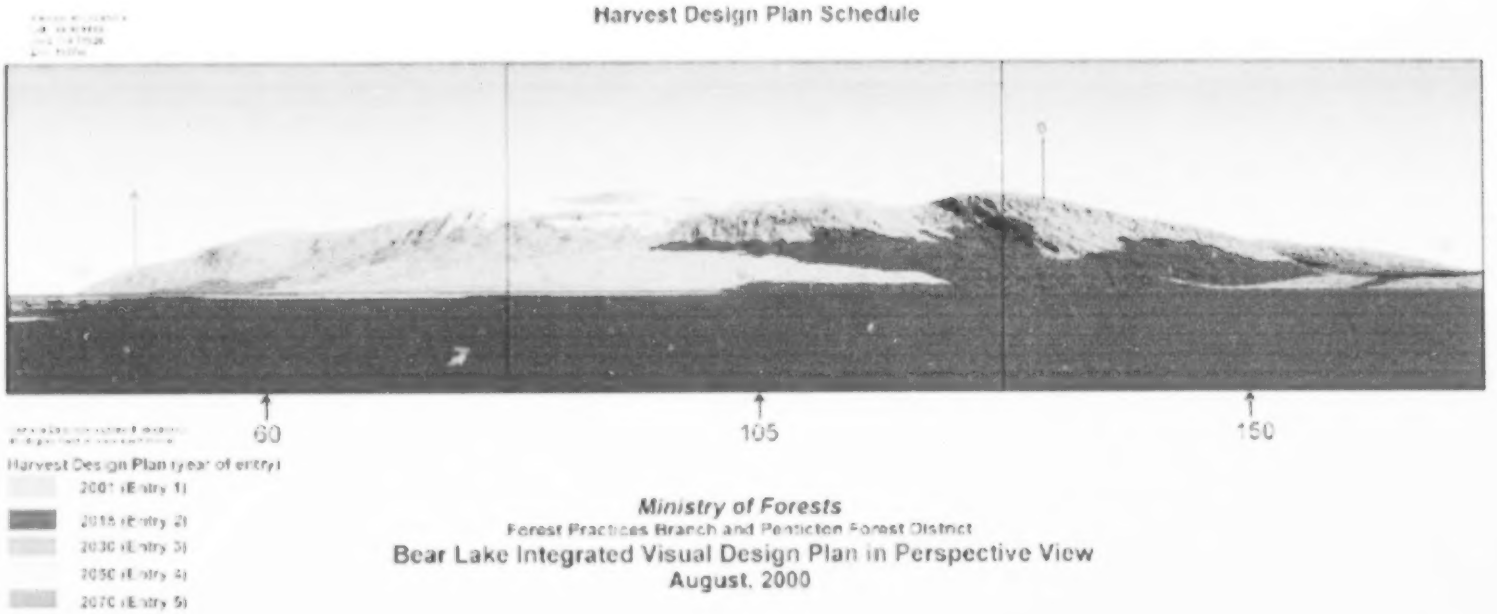

Figure 16: Complete Pattern of Harvest units

Figure 17: Harvesting Proposed for 2001

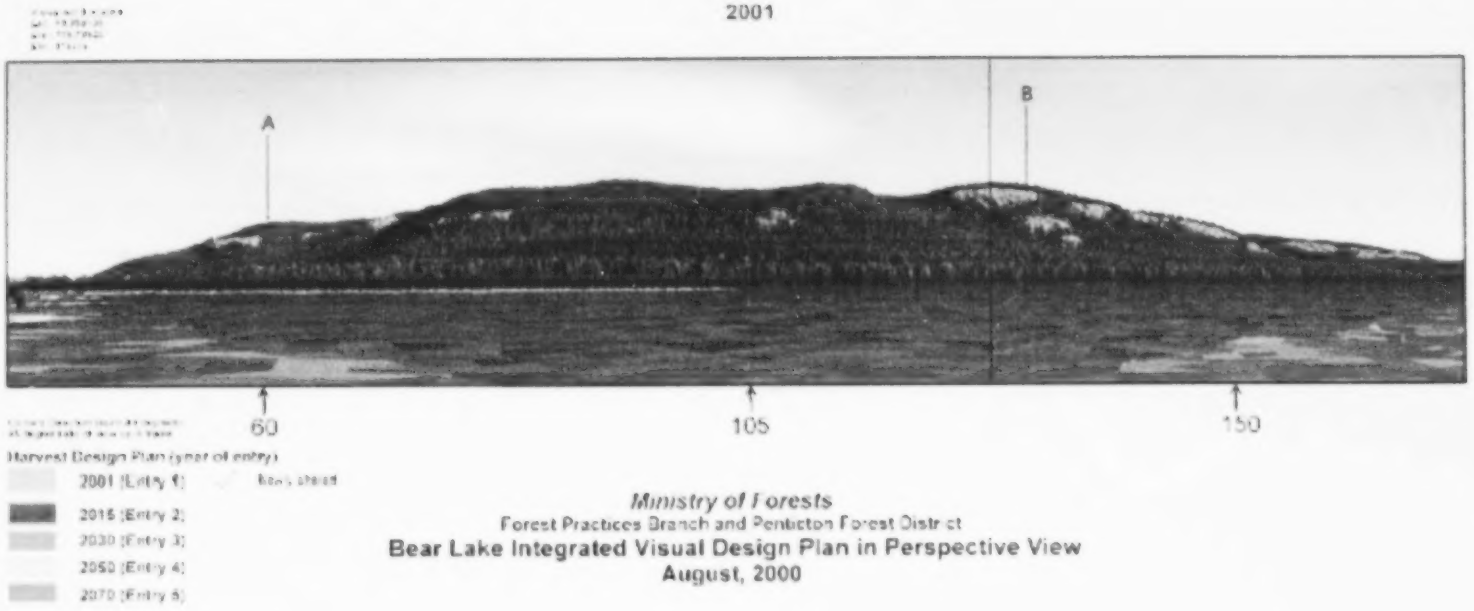

Figure 18: Visual Simulation of harvesting proposed for 2001

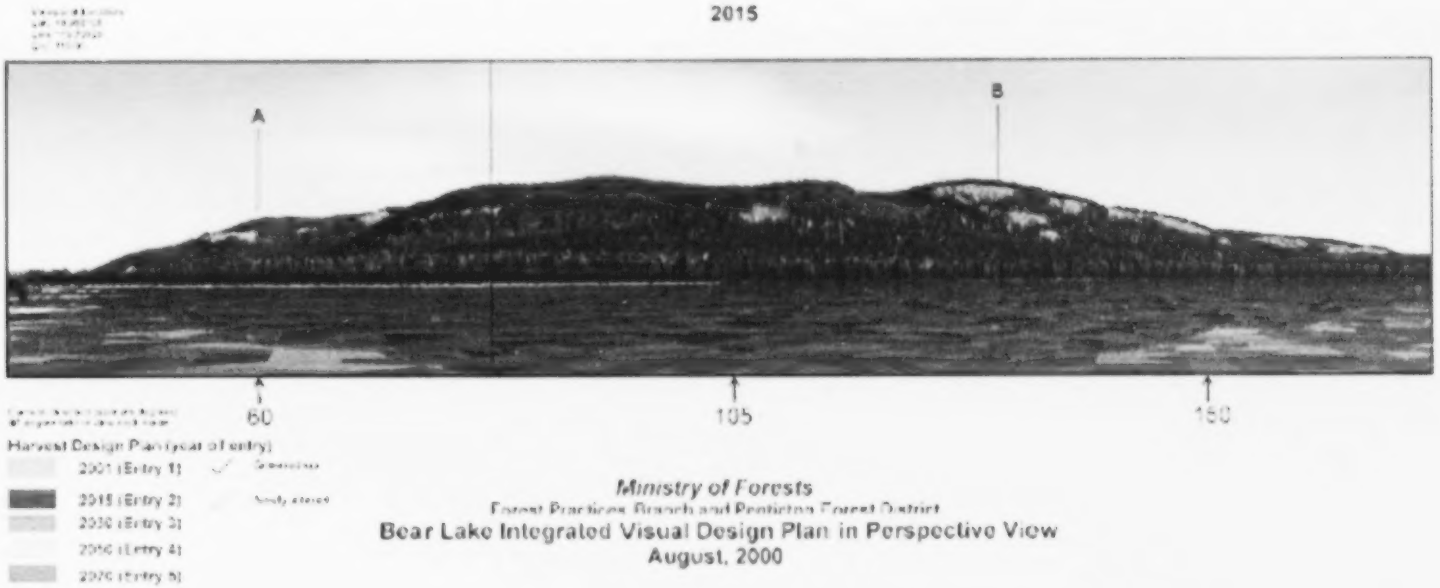

Figure 19: Visual Simulation of harvesting proposed 2015

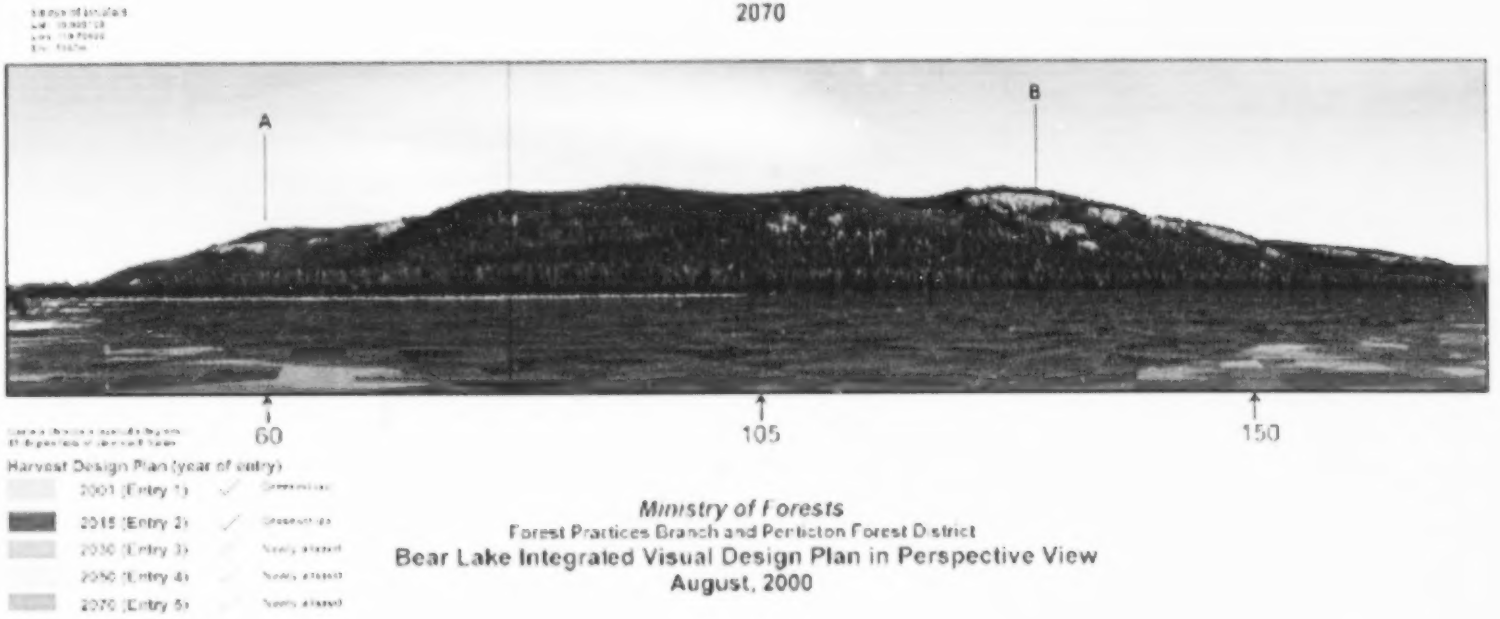

Figure 20: Visual Simulation of harvesting proposed 2030-2070

Appendix I: Bear Lake Integrated Visual Design Plan

Volume / Area Summaries[1]

BLOCKS 1A / 1B / 1C
Block 1A

Block No.	*Area (ha.)*	*Volume- Pl Species (m3)*	*Volume – Fd Species (m3)*	*Total Volume (m3)*
1A	39	9030	455	9485
1B	19	4620		4620
1C	5		789	789
Totals	**63**	**13,650**	**1244**	**14,894**

Silvicultural System

Blk 1A

- Clear –cut with Reserve, retaining approximately 10% of younger (age class 6 or less) Fd stems in the stand to address biodiversity considerations.

Blk 1B

- Small patch cut of Pl species, retaining the young Fd stems (approximately 30% of the stand) in the interior of the stand.

Blk 1C

- Selective aerial harvest of the Fd type – removing approximately 45% of the stand volume.
-

Harvest System

Blk 1A

- Ground based Skidder or Harvester / Forwarder system

Blk 1B

- Ground based Skidder or Harvester / Forwarder with aerial in upper reaches

Blk 1C

- Aerial (drop zone on existing roadway.

[1] **NOTE:** The volume area summaries are derived from FC1/ FIP file information and GIS analysis. While every effort has been made to ensure accuracy, these figures should be considered preliminary only and subject to revision as further, more detailed information regarding the site and stand becomes available.

BLOCK 2

Block No.	*Area (ha.)*	*Volume- Pl Species (m3)*	*Volume – Fd Species (m3)*	*Total Volume (m3)*
2	59	7186	2327	9513
Totals	**59**	**7186**	**2327**	**9513**

Silvicultural System

- Clear –cut with Reserve, retaining approximately 10% of younger (age class 6 or less) Fd stems in the stand to address biodiversity considerations. Retain Fd stems in upper reaches (age class 5) – approximately 10% of the stand.

Harvest System

- Ground based Skidder and Cable with aerial harvest in upper reaches of the block.

Composite Summary of Volume / Area / Species by Block

Block No.	*Area (ha.)*	*Volume- Pl Species (m3)*	*Volume – Fd Species (m3)*	*Total Volume (m3)*
1 (a,b,c)	63	13,650	1244	14,894
2	59	7186	2327	9513
Totals	**122**	**20,836**	**3571**	**24,407**